

Sample UBD Unit for Middle School Robotics

South Dakota Middle School Technology Education Course Content Standards Covered:

TEMS.1.2 Examine the core relationships between technology and other areas of study

TEMS.3.2 Demonstrate an understanding of engineering design

RMMS.1.1 Students will demonstrate knowledge of equipment used in robotics

RMMS.1.2 Students will demonstrate the use of programming commands

RMMS.2.1 Students will compare and contrast robotics labor vs. human labor

RMMS.3.1 Students will identify an endeavor in which robotic applications would be appropriate

RMMS.3.2 Students will propose a robotic design specifying specific purpose

RMMS.3.3 Students will construct a robot

RMMS.3.4 Students will program a robot

RMMS.3.5 Students will test and evaluate a robot as it relates to the task it was programmed to complete

Technology Education Standard #11

Apply Design Processes

Technology Education Standard #19

Manufacturing Technologies

Technology Education Standard #16

Energy and Power Technologies

Middle School Robotics Unit (15 days)

Identify desired results:

Students will demonstrate knowledge of....

- Robotic Programming
- Robotic Sensors
- Robotic Applications
- Robotic Systems

What will students understand as a result of this unit?

- Students will understand the advantages and disadvantages of Robotic labor
- Students will understand why Robots are not always the best option in manufacturing
- Students will understand the role of humans in a robotic environment

What are the overarching “essential” questions?

- How have robots changed the manufacturing industry?
- How does robotics affect my life? (the student)

What “essential” and “unit” questions will focus this unit?

- When is it more feasible to buy a robot to do human work?
- How has robotics changed the production of goods?

What evidence will show that students understand robotics?

- Students will construct a robot

- Students will create a series of programs to accomplish simple tasks
- Students will analyze the choice of using robotic labor vs. human labor
- Robotics Vocabulary quiz

Other Evidence:

- I will be making observations throughout the projects and “jumpstarting” their thinking with probing questions.

Student Self-Assessment:

- Self assess your programming knowledge.....What tasks could a robot be programmed to do?

Given the targeted understandings, other unit goals, and the assessment evidence identified, what knowledge and skills are needed?

Students will need to know...

- Key terms: manufacturing, slave labor, work envelope, sensor, programming (robots), economically feasible, repetitive, robot, teach pendant, automation
- Types of sensors
- Programming functions

Students will need to be able to...

- Demonstrate appropriate programming of a robot
- Organize an informal presentation of a robot program (purpose)
- Determine the appropriateness of robotic labor over human labor when given costs and other determining factors

What teaching and learning experiences will equip students to demonstrate the targeted understandings?

1. Students will explain the function of various sensors as they relate to robotics in industry
2. Give the students explanations and examples of the importance of robotics in the manufacturing process.
3. Students will complete a program when given certain requirements and limitations
4. Prompt the students with periodic questions relating to their program and their thought process
5. Assess and give feedback on robotic program
6. Have students research costs human labor vs. robotic labor and determine which is more appropriate

Explanation of 15 day Robotics Unit

In this unit we use the Lego NXT robot kits. These are the same robots that are used in the international First Lego League competition. We have an after school First Lego League club that meets weekly. By integrating the NXT robots into our Technology Education curriculum we are not only meeting the state standards for Middle School Robotic but, we are also giving our Lego League kids a head start. Students will work in groups of two. The 15 day unit looks something like this:

DAY 1-3 Build Robot

Use step by step directions in the book or on the computer.

DAY 4-5 Programming

Drive Forward

Drive in Reverse

Assessment: Program your robot to drive 100 cm with a tolerance of 1 cm

DAY 6-8 Programming

Accelerate

Curve Turn

Play Sound

Assessment: Program your robot to follow a zig zag line forward and then backward. End the program with a victory dance and repeating sound of choice.

DAY 9-11 Programming

Sensors

Detect Sound

Sound Control

Detect Distance

Distance Control

Detect Dark Line

Follow a Line

Detect Touch

Sensor Bumper

DAY 12-15 Final Assessment

½ Programming Assessments

½ Written Assessments